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Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America for the term set forth below, subject to the payment of maintenance fees as provided by law.

If this application was filed prior to June 8, 1995, the term of this patent is the longer of seventeen years from the date of grant of this patent or twenty years from the earliest effective U.S. filing date of the application, subject to any statutory extension.

If this application was filed on or after June 8, 1995, the term of this patent is twenty years from the U.S. filing date, subject to any statutory extension. If the application contains a specific reference to an earlier filed application or applications under 35 U.S.C. 120, 121 or 365(c), the term of the patent is twenty years from the date on which the earliest application was filed, subject to any statutory extension.

J. Todd Pichini

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Attest



US005933165A

United States Patent [19]

Shirato et al.

[11] **Patent Number:** 5,933,165[45] **Date of Patent:** *Aug. 3, 1999[54] **INK JET RECORDING APPARATUS AND METHOD USING INK JET HEAD HAVING U-SHAPED WIRING**

[75] **Inventors:** Yoshiaki Shirato, Yokohama; Yasushi Takatori, Sagami-hara; Toshitami Hara, Tokyo; Yukuo Nishimura, Sagami-hara; Michiko Tanaka, Ohizumimachi, all of Japan

[73] **Assignee:** Canon Kabushiki Kaisha, Tokyo, Japan

[*] **Notice:** This patent is subject to a terminal disclaimer.

[21] **Appl. No.:** 08/407,397

[22] **Filed:** Mar. 17, 1995

Related U.S. Application Data

[63] Continuation of application No. 08/159,709, Dec. 1, 1993, abandoned, which is a continuation of application No. 07/998,053, Dec. 29, 1992, abandoned, which is a division of application No. 07/711,418, Jun. 5, 1991, Pat. No. 5,204,689, which is a continuation of application No. 07/632,610, Dec. 27, 1990, abandoned, which is a continuation of application No. 07/403,860, Sep. 1, 1989, abandoned, which is a continuation of application No. 07/188,071, Apr. 28, 1988, abandoned, which is a continuation of application No. 07/013,172, Feb. 9, 1987, abandoned, which is a continuation of application No. 06/846,472, Mar. 31, 1986, abandoned, which is a continuation of application No. 06/750,985, Jul. 1, 1985, abandoned, which is a continuation of application No. 06/639,531, Aug. 9, 1984, abandoned, which is a continuation of application No. 06/543,224, Oct. 20, 1983, abandoned, which is a continuation of application No. 06/362,579, Mar. 29, 1982, abandoned, which is a continuation of application No. 06/132,774, Mar. 24, 1980, abandoned.

[30] **Foreign Application Priority Data**

Apr. 2, 1979 [JP] Japan 54-39478

[51] **Int. Cl.⁶** B41J 2/05

[52] **U.S. Cl.** 347/58

[58] **Field of Search** 347/58, 63-65, 347/208, 209, 210, 211

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[57] **ABSTRACT**

An ink jet recording method includes the steps of providing an ink jet recording head having a plurality of discharge openings for discharging ink, a plurality of liquid passageways for holding ink and a plurality of heat generating members. Each of the heat generating members corresponds to a liquid passageway and each heat generating member has a pair of electrodes for driving the heat generating member individually and the electrodes and corresponding heat generating member form a U-shaped wiring portion. The recording head may be manufactured using a cutting process. A voltage is applied to selected pairs of electrodes for driving selected heat generating members individually for providing thermal energy to the ink in the liquid passageway for abruptly forming a bubble and discharging ink from the discharge opening and recording on a recording medium.

5 Claims, 5 Drawing Sheets